In response, it is admitted that **Clapp et al.** discloses "joule heating strips 19 (that is, heater electrodes)" (Fig. 1, Fig. 2 and col. 5 line 23), "including within the optical cavity a portion of a medium 18 (that is, a groove structure)" (Fig. 1, Fig. 2 and col. 4 lines 30-31) and "a medium 18 whose refractive index is controllable. (that is it would change/control the refractive index of the filling material,)" (col. 4 lines 31-32).

However, it is apparent that the "TUNEABLE OPTICAL FILTERS" (Title of the **Clapp et al.** reference) would change/control wavelength bands of the propagating light, because it is the filter which passes the light in the predetermined bands of wavelength by seeing the disclosure "filters for use in wavelength division multiplexed (WDM) optical transmission systems." (col. 1 lines 7-9).

The "TUNEABLE OPTICAL FILTERS" of **Clapp et al.** never change/control a divergence angle or a propagating direction of the propagating light, as in the present invention, because the filters comprise neither lens-shaped grooves nor wedge-shaped grooves. Therefore, it is physically impossible in the apparatus of **Clapp et al.** to change/control a divergence angle or a propagating direction of the propagating light, as claimed in the present invention.

The Examiner has also urged that paragraph [0056] of **Kamei et al.** teaches:

> "...grooves with material...in order to eliminate the temperature dependent of the transmission wavelength of the arrayed-waveguide grating ((one embodiment)), OR to reduce the electrical power consumption of the thermo-optical switch ((another embodiment)).

In response, it should be noted that there is no heater in either the Eighth Embodiment of **Kamei et al.**, as explained with Fig. 32, or the Fifteenth Embodiment, as explained with Fig. 40. There is neither a lens-shaped groove nor a wedge-shaped groove in the Tenth Embodiment of **Kamei et al.**, as explained with Fig. 34. Therefore, it is physically impossible for those embodiments to control/change a divergence angle or a propagating direction of the propagating light. In contrast, the present invention can control/change a divergence angle or a propagating direction of the propagating

light by comprising both "lens-shaped groove structures or wedge-shaped groove structures" and "a heater electrode".

An arrayed-waveguide grating ([0228]), which is included in the Eighth Embodiment of **Kamei et al.**, is explained with Fig. 32, which is an enlarged plan view showing the characteristic compensation region 69 to athermalize the transmission wavelength of FIG. 31 ([0213]). It is apparent that there is no heater in this Eighth Embodiment by observing Fig. 31 and Fig. 32. Therefore, it is impossible for the grooves 82a-82n to control/change a divergence angle or a propagating direction of the propagating light, because there is no means to control the temperature of the grooves 82a-82n. The grooves are formed as in the following. "The grooves 82a-82n across the arrayed-waveguides 81 are each formed such that their width monotonically increases from W_{mm1}, to $W1+W_{min1}$. In addition, in accordance with the length of the arrayed-waveguides 81, each of which increases by the fixed amount ΔL, the width of the grooves 82a-82n is increased by an amount ΔL, in proportional to the fixed amount ΔL." ([0224])

An arrayed-waveguide grating ([0291]), which is included in the Fifteenth Embodiment of **Kamei et al.**, is explained with Fig. 40, which is an enlarged plan view showing the neighborhood of a slab waveguide 413a of FIG. 39 ([0291]). It is apparent that there is no heater in this Fifteenth Embodiment by observing Fig. 39 and Fig. 40. Therefore, it is impossible for the grooves 418a-418n to control/change a divergence angle or a propagating direction of the propagating light, because there is no means to control the temperature of the grooves 418a-418n. The grooves are formed as in the following. "The widths of the grooves 418a-418n across the slab waveguide 413a are specified as follows. As for a line connecting the input waveguide 414a with an (i+1) th waveguide of the arrayed-waveguides 412, assume that it traverses each of the grooves 418a-418n at a width L'/n as illustrated in FIG. 40. In this case, the widths of the grooves are determined as to the line connecting the input waveguide 414a with the ith waveguide of the arrayed-waveguides 412 such that the length of the line segment traversing each of the grooves 418a-418n becomes (L'/n+ΔL'/n), where ΔL' is a value proportional to the fixed amount ΔL." ([0296])

A thermo-optic switch ([0243]), which is included in the Tenth Embodiment of **Kamei et al.**, is explained with Fig. 34 and has a thin-film heater 107 ([0250]). However, the groove 110 shown in Fig. 34 has the shape of a rectangle, and is neither lens-shaped nor wedge-shaped. Therefore it is impossible for the groove 110 to control/change a divergence angle or a propagating direction of the propagating light, as in the present invention.

As noted above, the Examiner pointed out that in a 10th embodiment, as illustrated in Figure 34, **Kamei et al.** discloses a waveguide comprising groove 110 filled with a characteristic compensation material (e.g. a temperature compensation material) in region 109 for reducing the electrical power consumption, wherein the temperature of groove 110 or region 109 is controlled by a thin-film heater 107 (**Kamei et al.**, [0250], [0251]). Furthermore, groove structures (e.g. lens-shaped grooves 418a-418n or wedge-shaped grooves 82a-82n) in figure 32 and figure 40 are also filled with the same characteristic compensation material used in region 109 as mentioned above; therefore, they would behave/function in the same way.

As mentioned above, Applicants respectfully submit that there is no heater either in the Eighth Embodiment, as explained with Fig. 32, or in the Fifteenth Embodiment, as explained with Fig. 40. The Tenth Embodiment, as explained with Fig. 34, which has thin-film heater 107, has neither a lens-shaped groove nor a wedge-shaped groove. Therefore, it is physically impossible for those embodiments to change/control a divergence angle or a propagating direction of the propagating light. The present invention can control/change a divergence angle or a propagating direction of the propagating light by comprising both "lens-shaped groove structures or wedge-shaped groove structures" and "a heater electrode". No references disclose the feature of controlling/changing a divergence angle or a propagating direction of the propagating light, as in the claimed invention.

Thus, in view of the remarks above the 35 U.S.C. §103(a) rejection should be reconsidered and withdrawn, and a Notice of Allowance is earnestly solicited.

The Director is hereby authorized to charge any deficiency in the fees filed, asserted to be filed or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our Deposit Account No. 04-1105.

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Respectfully submitted,

CUSTOMER NO.: 21874

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